Advancing Drought Onset Detection and Seasonal Prediction Using a Composite of NASA Models and Satellite Data

Amir AghaKouchak, Shahrbanou Madadgar, Shrad Shukla, Kuolin Hsu, Soroosh Sorooshian

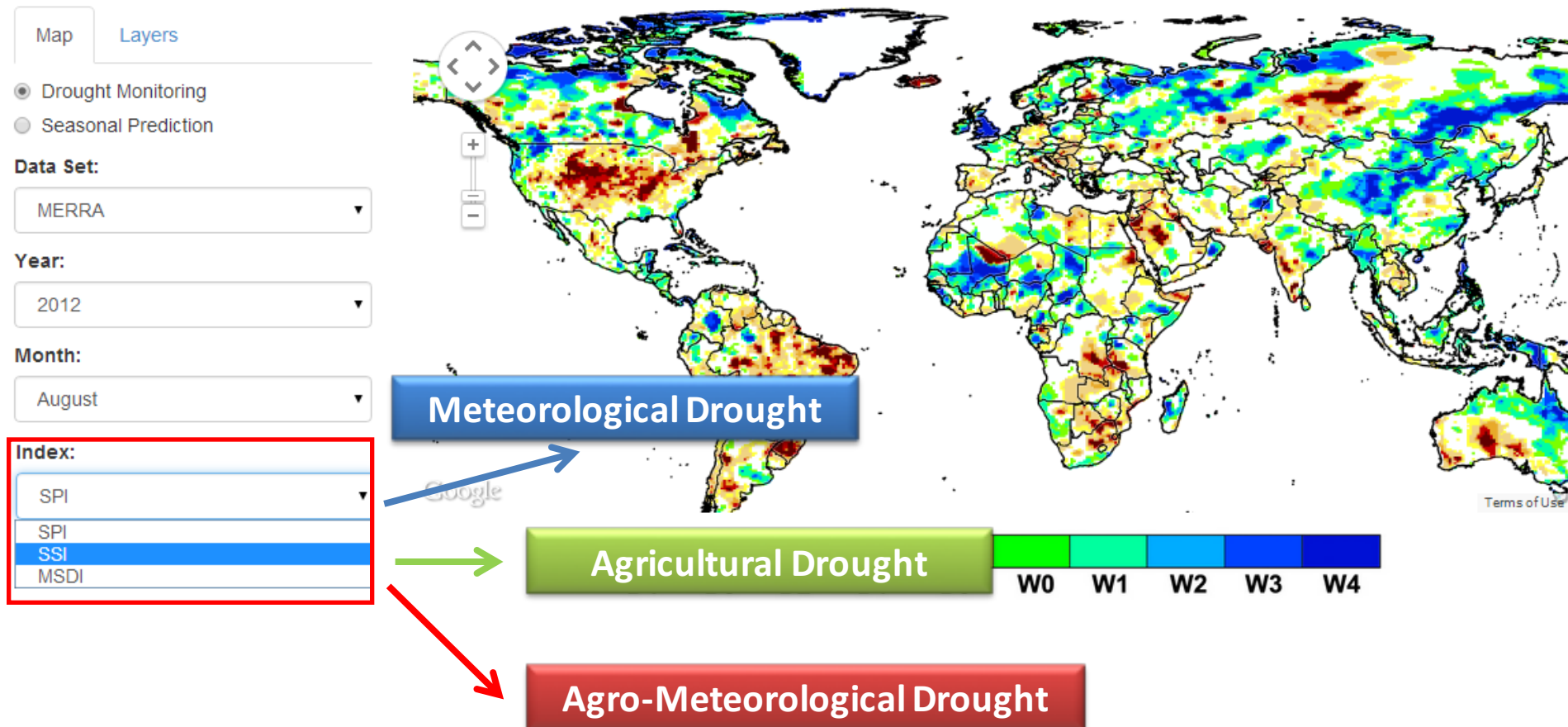*University of California, Irvine*

Jeanine Jones, Michael Anderson

California Department of Water Resources

http://drought.eng.uci.edu/

Global Integrated Drought Monitoring and Prediction System (GIDMaPS)

Map | Layers

● Drought Monitoring
○ Seasonal Prediction

Data Set:
MERRA

Year:
2012

Month:
August

Index:
SPI

SPI
SSI
MSDI

Meteorological Drought

Agricultural Drought

Agro-Meteorological Drought

W0 W1 W2 W3 W4

Hao Z., AghaKouchak A., Nakhjiri N., Farahmand A., 2014, Global Integrated Drought Monitoring and Prediction System, *Scientific Data*, 1:140001, 1-10, doi: 10.1038/sdata.2014.1.
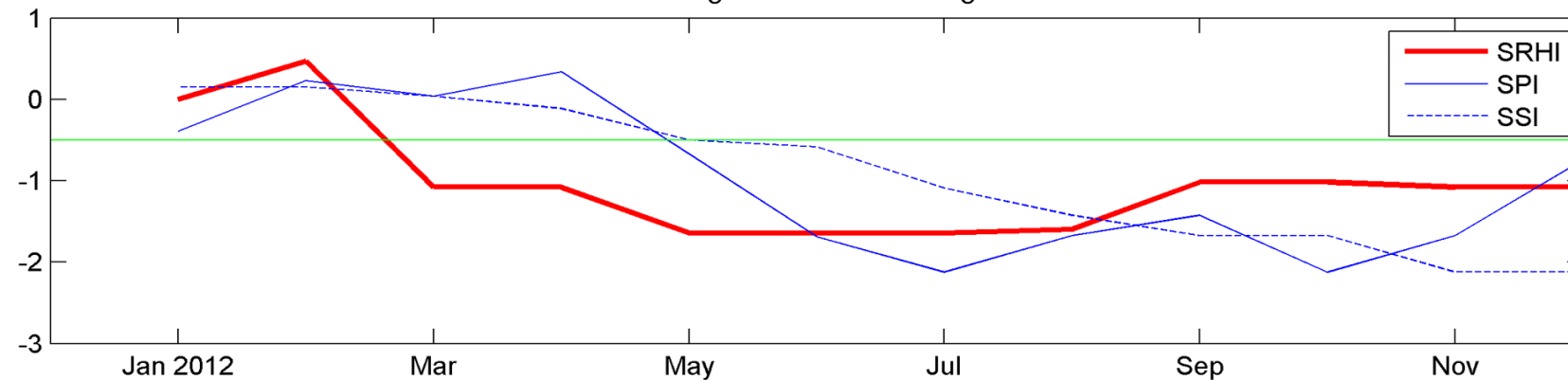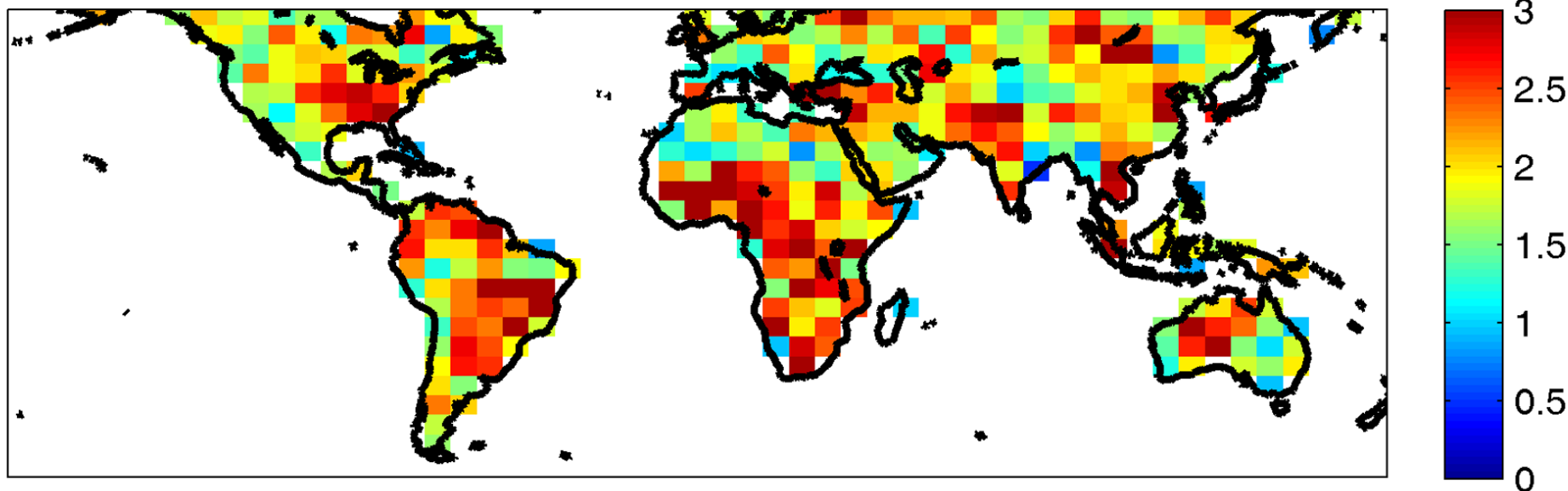http://www.nature.com/articles/sdata20141

2012 US Drought   Latitude 40 Longitude -100

2012 US Drought   Latitude 39 Longitude -90

Farahmand et al. 2015; http://www.nature.com/srep/2015/150225/srep08553/full/srep08553.html
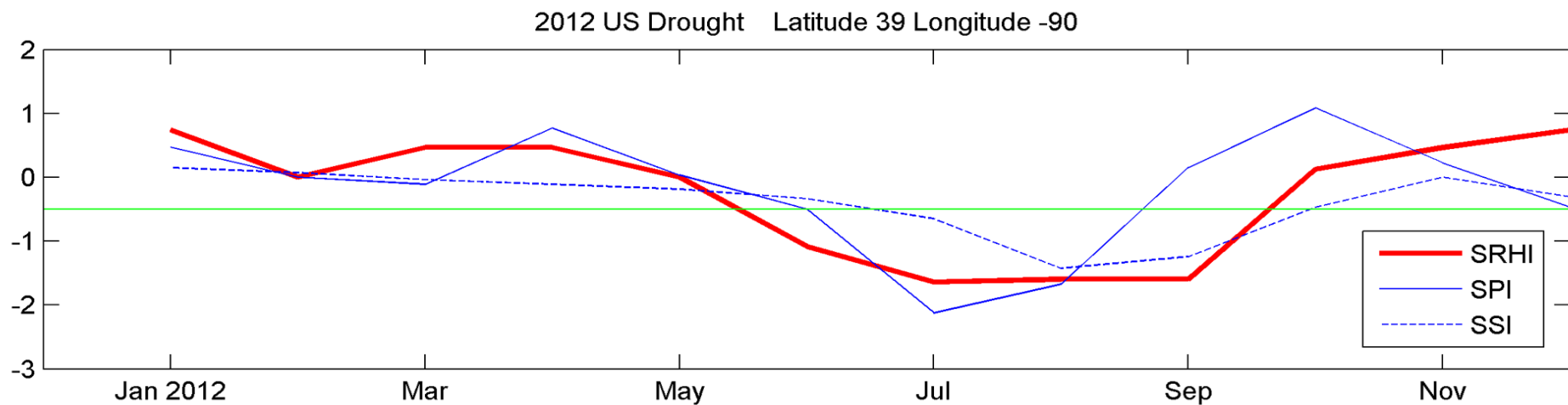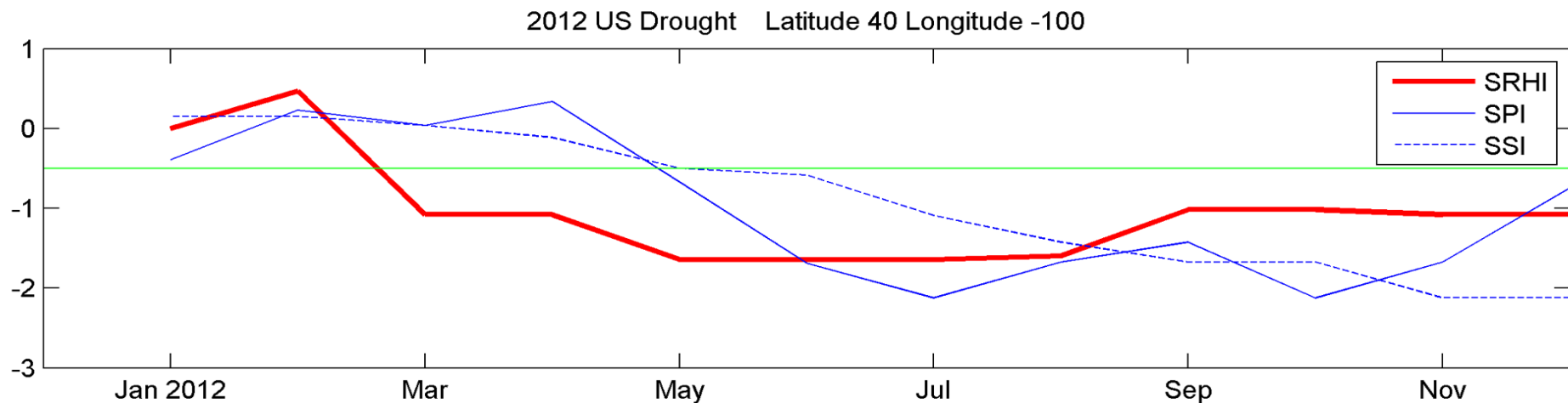
2012 US Drought   Latitude 40 Longitude -100

Mean lead time based on SRHI relative to SPI (months).

Farahmand et al. 2015; http://www.nature.com/srep/2015/150225/srep08553/full/srep08553.html

Observed Precipitation Anomaly DJF 2014
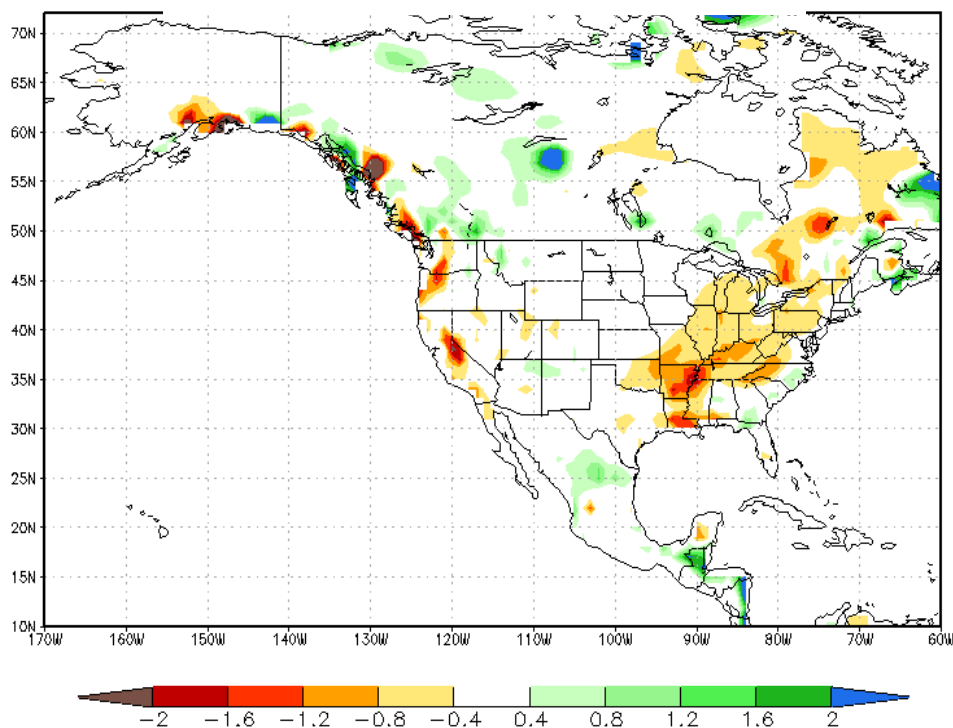
Predicted Precipitation Anomaly (mm/d) DJF 2014 (Initialized: November)
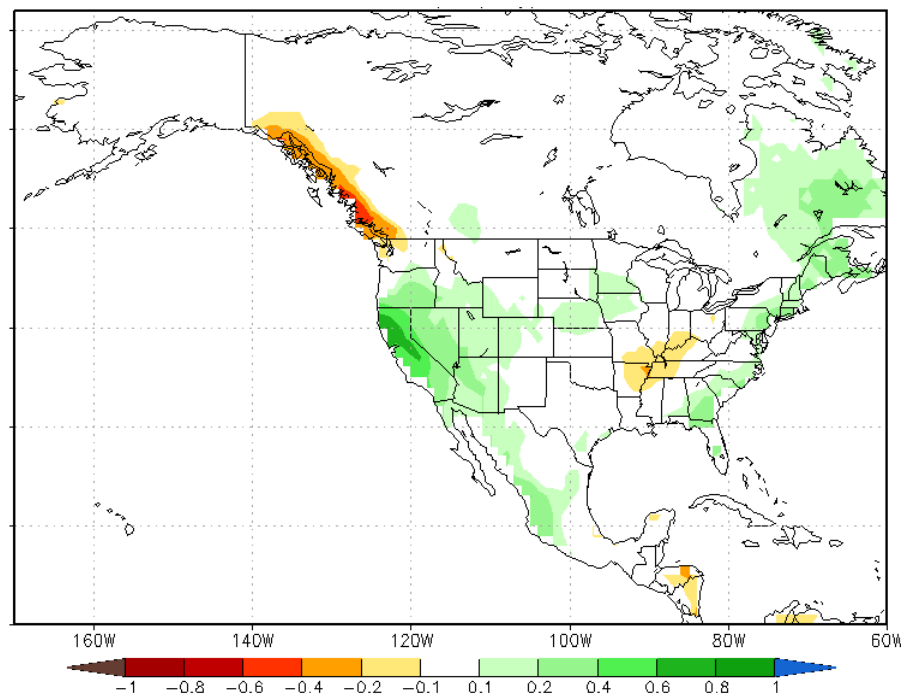
North American Multi-Model Ensemble (NMME; Kirtman et al., 2014)

Low Predictability of Precipitation Forecasts in Dynamic Model Simulations

CA Division 5 October-March Precipitation
(versus Southern Oscillation Index for prior June-November)

Years 1933/1934-2013/2014
$r^2 = 0.09$
Correlation = -0.3

Mean = 19.21 in
Mean all = 16.83 in
Mean = 16.83 in
Mean = 14.91 in

June-November SOI (Tahiti minus Darwin)

El Niño   Neither   La Niña

Western Regional Climate Center
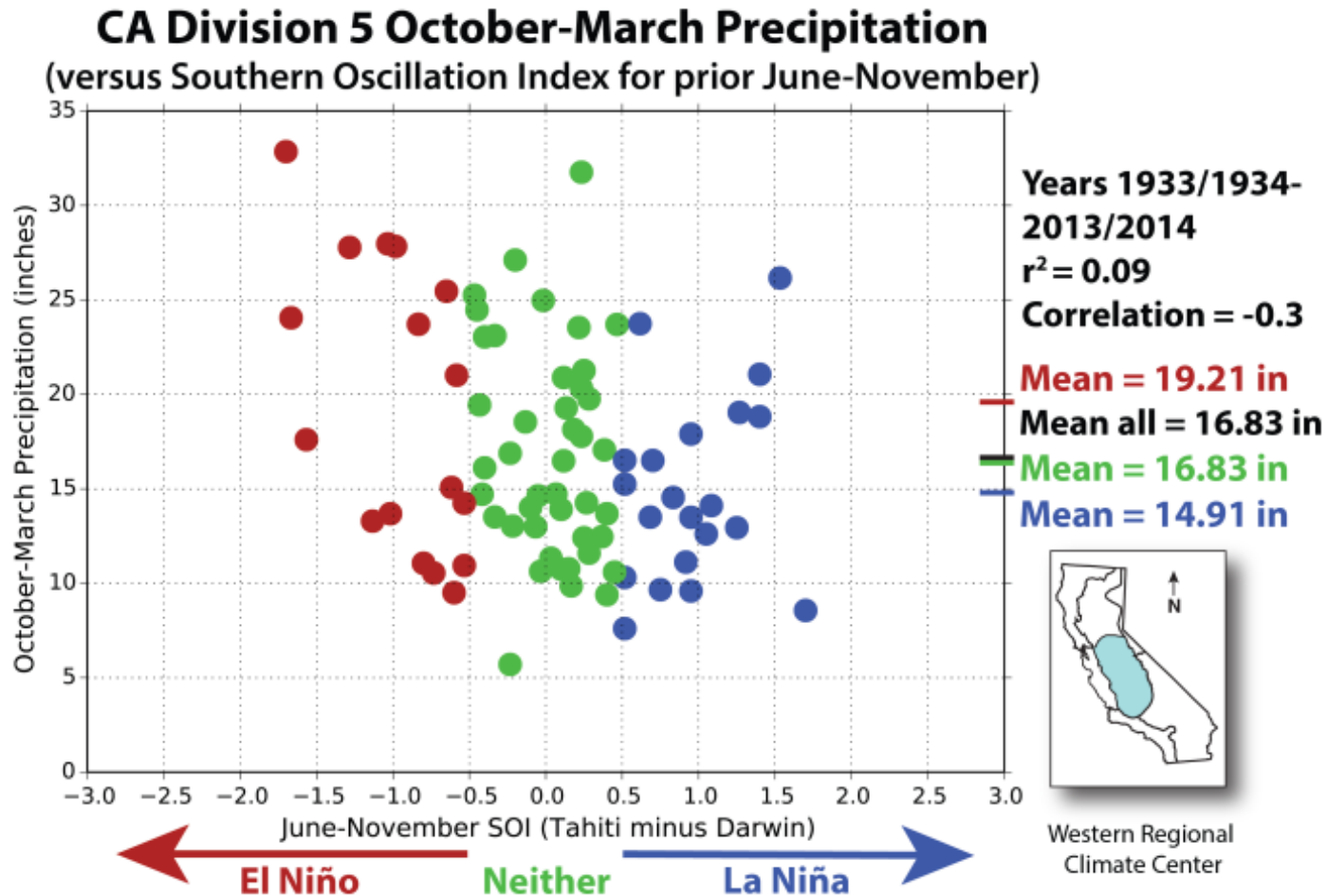
Analog-year based models also offer low predictability

Analog-Year Model Combined with Dynamic Model Simulations

EA Algorithm to Weigh Ens. Members
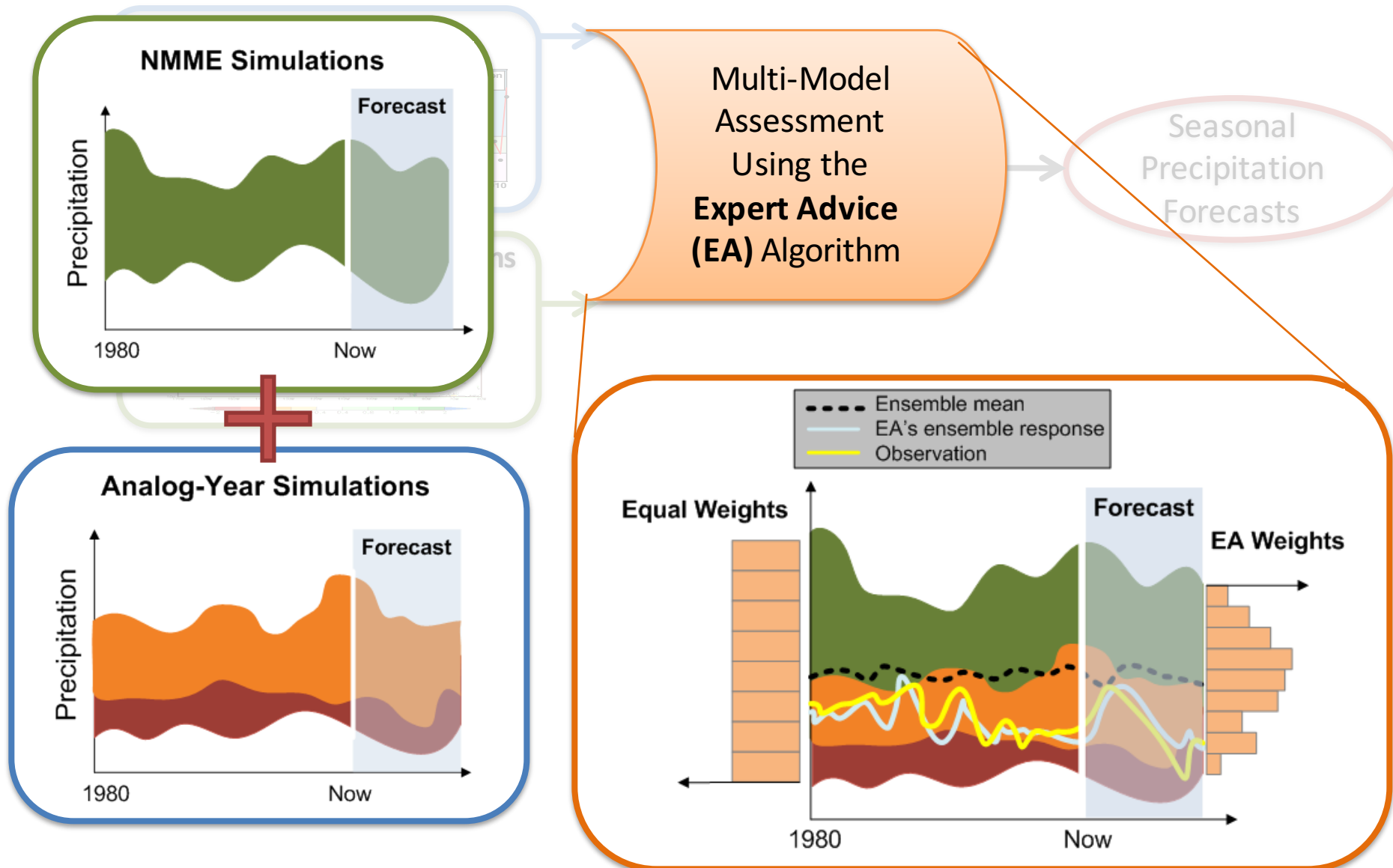
NDJ, 2014

Observation
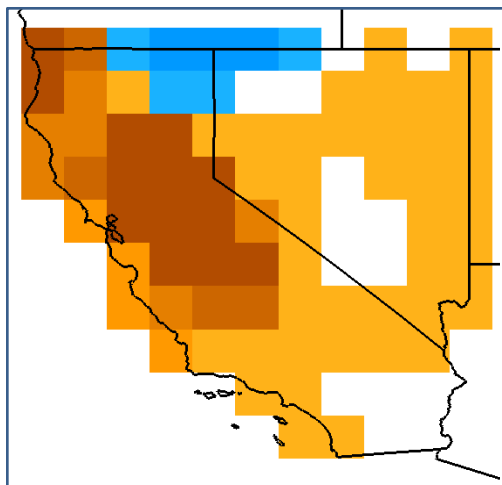
NMME (Ensemble mean)
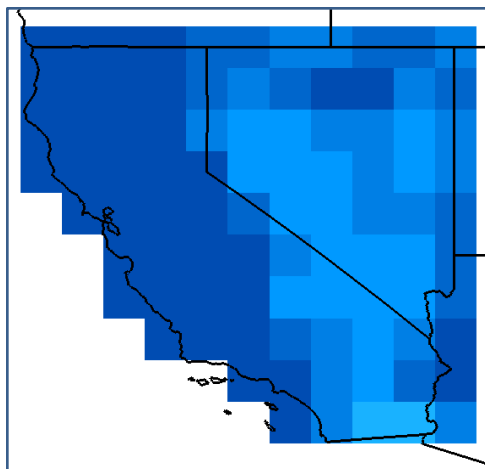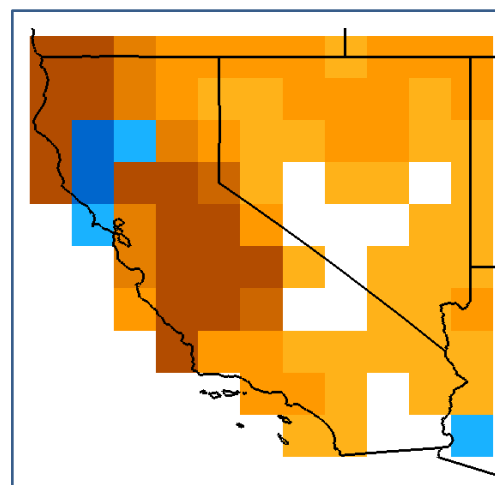

NMME + Analog-Year + EA

NDJFM, 2014

JFM (2006-07), Obs
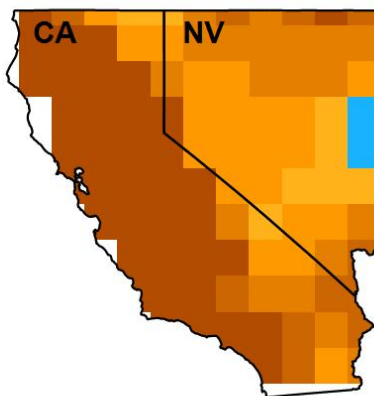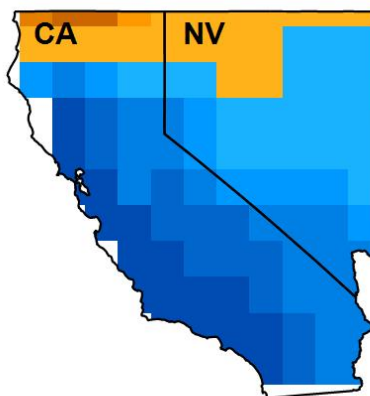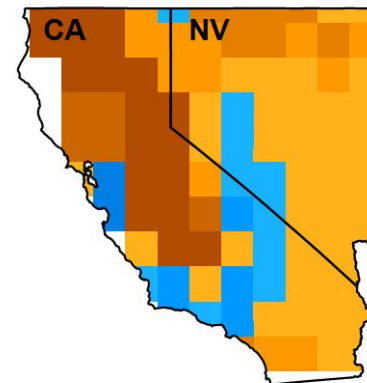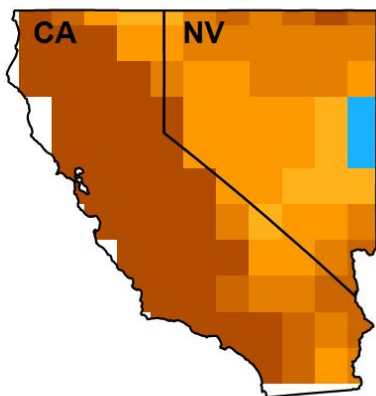
JFM (2006-07), NMME
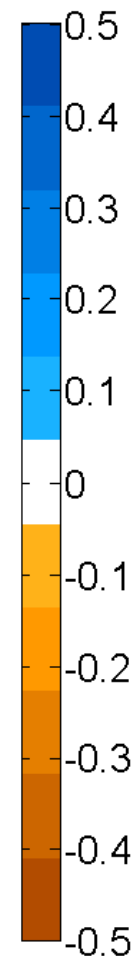
JFM (2006-07), Hybrid

Drought Prediction

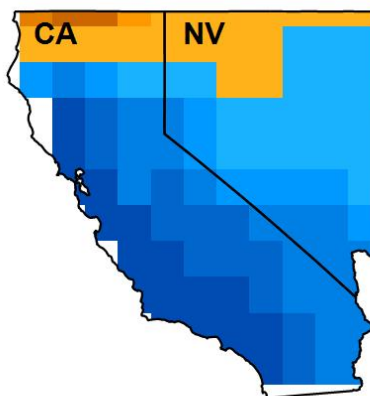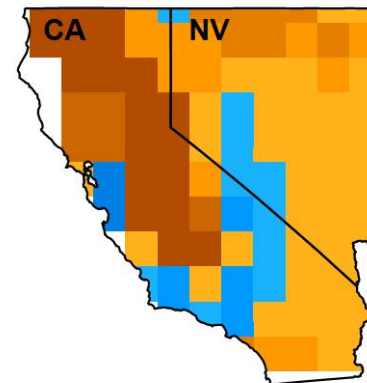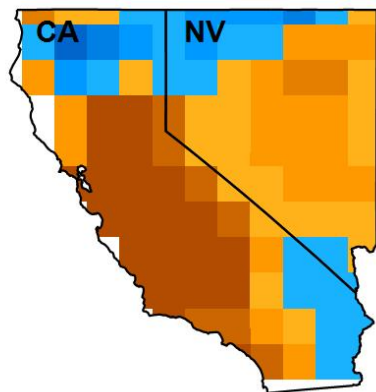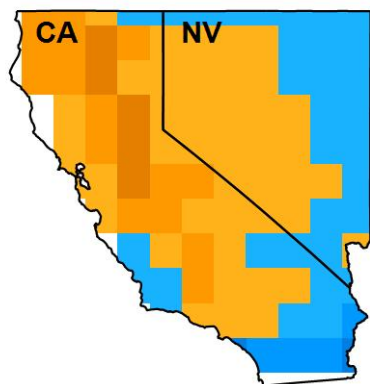JFM (2006-07), Obs   JFM (2006-07), NMME   JFM (2006-07), Hybrid
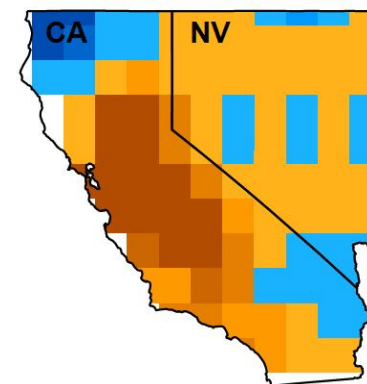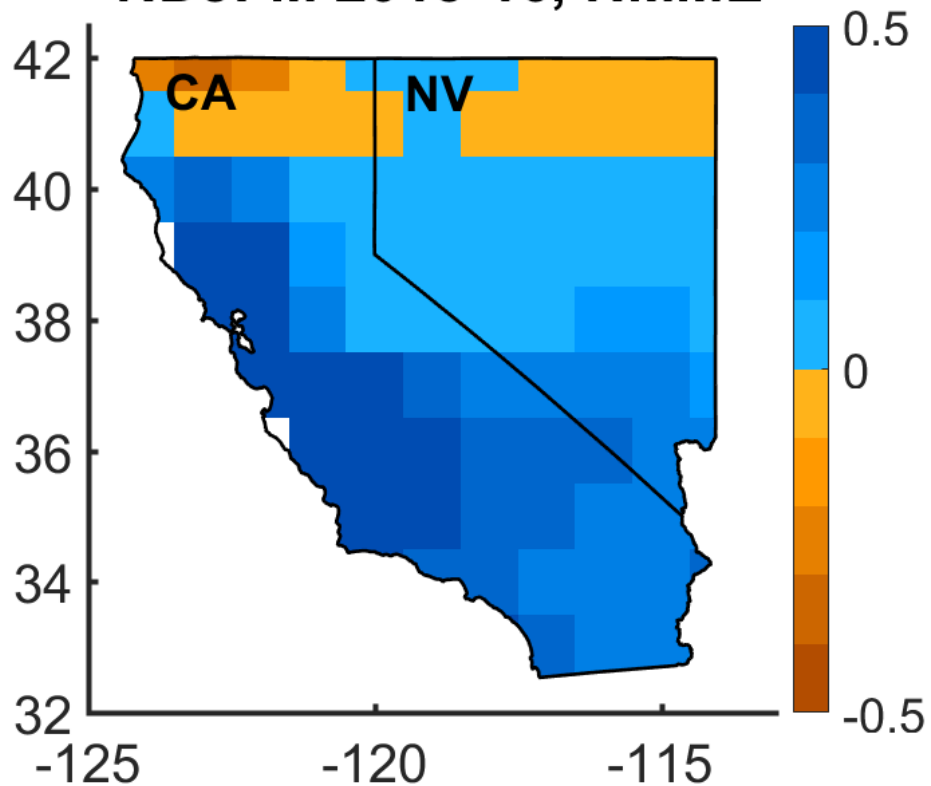
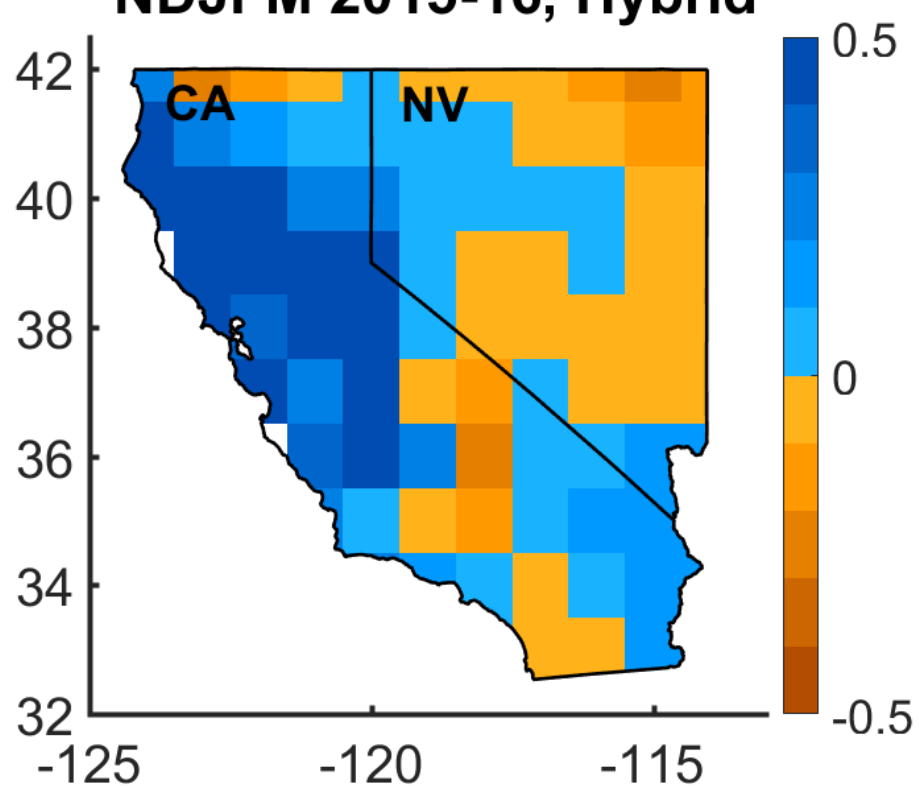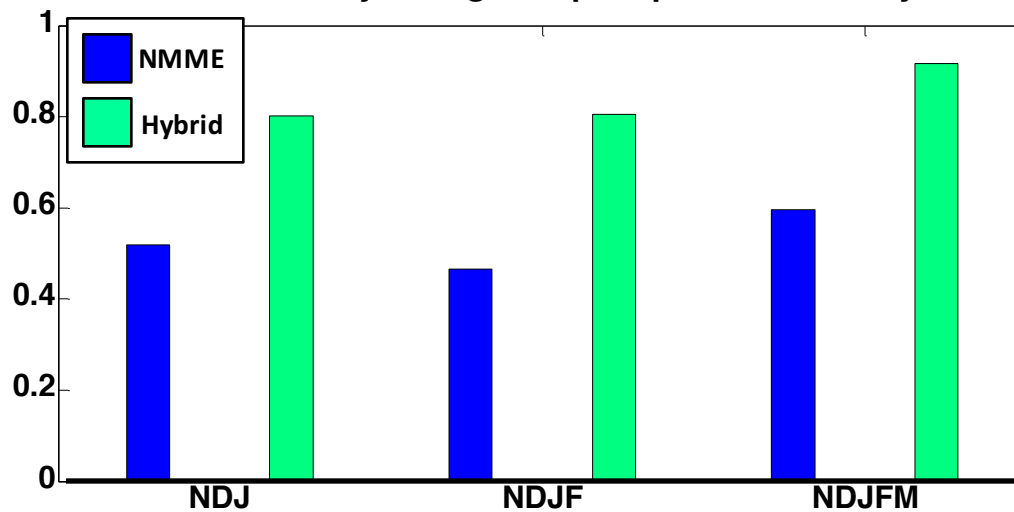DJF (2014-15), Obs   DJF (2014-15), NMME   DJF (2014-15), Hybrid

NDJFM, 2015-16
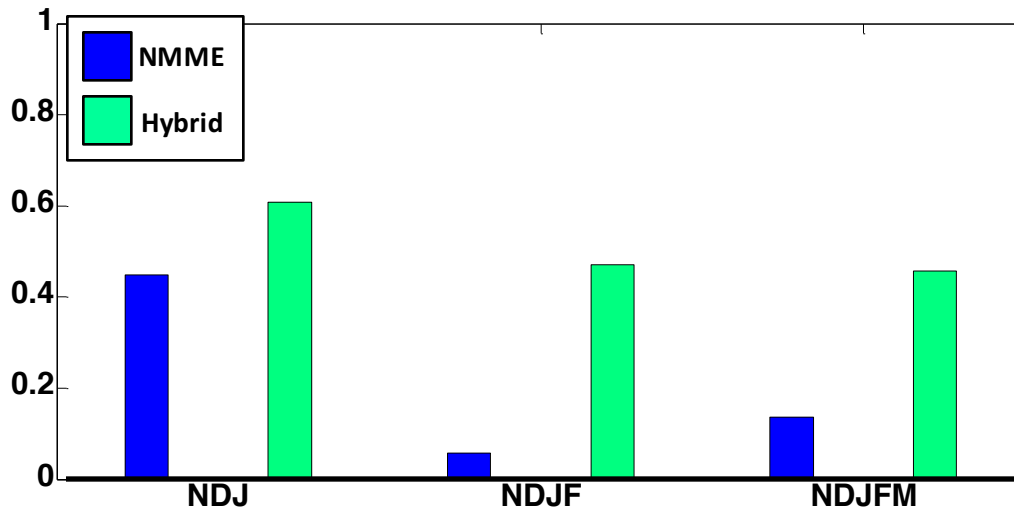
Predictability of negative precipitation anomaly

Predictability of positive precipitation anomaly

Questions?

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